CLAIMS

What is claimed is:

1.   A method for discriminating an agent, comprising the steps of:

       a.   constructing a decision tree having a plurality of branches, each branch corresponding to at least one defined action, wherein each branch comprises a plurality of successive branches, each successive branch corresponding to at least one defined action;

       b.   providing a conditioned environment sensitive to the agent;

       c.   obtaining data from response of the agent to the conditioned environment;

       d.   extracting features from the obtained data;

       e.   selecting a branch from the decision tree corresponding to the features;

       f.   performing on the features at least one defined action corresponding to the branch;

       g.   producing a classification of the agent; and

       h.   iteratively repeating steps of (d)-(g) until the agent is discriminated.

2.   The method of claim 1, wherein the agent comprises a chemical agent.

3.   The method of claim 1, wherein the agent comprises a non-chemical agent.

4.   The method of claim 1, wherein the agent comprises a biological agent.

5.   The method of claim 1, wherein the agent comprises a non-biological agent.

6.   The method of claim 1, wherein the constructing step comprises the step of choosing logic for successive refinement of agent classification.

7.   The method of claim 6, wherein the choosing step comprises the step of selecting logic for classification of a Neuro agent.

8.   The method of claim 6, wherein the choosing step comprises the step of selecting logic for classification of a Viral agent.

9.   The method of claim 1, wherein the providing step comprises the step of selecting of cell types to be exposed to the agent.

10. The method of claim 9, wherein the providing step further comprises the step of placing at least one cell of the selected cell types in the conditioned environment.

5   11.   The method of claim 1, wherein the providing step comprises the step of selecting of reagent quantities.

12. The method of claim 1, wherein the providing step comprises the step of selecting of a desired assay.

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13. The method of claim 1, wherein the selecting step comprises the step of selecting of a branch corresponding to at least one desired feature extraction algorithm from at least one library of algorithms.

15   14.   The method of claim 1, wherein the producing step comprises the steps of:
   a.   determining a classification method from a library of classification methods; and
   b.   applying the classification method to the features to produce the classification.

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15. A system for discriminating an agent, comprising:
   a.   means for constructing a decision tree having a plurality of branches, each branch corresponding to at least one defined action, wherein each branch comprises a plurality of successive branches, each
25   successive branch corresponding to at least one defined action;
   b.   a conditioned environment sensitive to the agent;
   c.   means for obtaining data from response of the agent to the conditioned environment;
   d.   means for extracting features from the obtained data;
30   e.   means for selecting a branch from the decision tree corresponding to the features;
   f.   means for performing on the features at least one defined action corresponding to the branch;
   g.   means for producing a classification of the agent; and
35   h.   means for iteratively repeating certain tasks until the agent is discriminated.

16. The system of claim 15, wherein the agent comprises a chemical agent.

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17. The system of claim 15, wherein the agent comprises a non-chemical agent.

18. The system of claim 15, wherein the agent comprises a biological agent.

5   19. The system of claim 15, wherein the agent comprises a non-biological agent.

20. The system of claim 15, wherein the constructing means comprises means for choosing logic for successive refinement of agent classification.

10   21. The system of claim 20, wherein the choosing means comprises means for selecting logic for classification of a Neuro agent.

22. The system of claim 7, wherein the choosing means comprises means for selecting logic for classification of a viral agent.

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23. The system of claim 15, wherein the conditioned environment comprises a plurality of cells to be exposed to the agent.

24. The system of claim 15, wherein the conditioned environment comprises a
20   plurality of reagent quantities.

25. The system of claim 15, wherein the conditioned environment comprises a plurality of a desired assay.

25   26. The system of claim 15, wherein the selecting means comprises means for selecting of a branch corresponding to at least one desired feature extraction algorithm from at least one library of algorithms.

27. The system of claim 15, wherein the producing means comprises a controller
30   performing the steps of:
    a.   determining a classification method from a library of classification methods; and
    b.   applying the classification method to the features to produce the classification.

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28. A method for discriminating an agent, comprising the steps of:
    a.   providing a plurality of L parameters, L being an integer, each parameter being related to the status of the agent;

b.   fitting the plurality of L parameters into a set of ith order differential equations, i = 1, . . ., N, N being an integer;

c.   obtaining a plurality of L features corresponding to L parameters, respectively, from the set of ith order differential equations;

5   d.   separating the L features into a plurality of classes with a corresponding confidence level;

e.   providing a plurality of L+1 parameters, each parameter being related to the status of the agent;

f.   fitting the plurality of L+1 parameters into a set of ith+1 order
10   differential equations;

g.   obtaining a plurality of L+1 features corresponding to L+1 parameters, respectively, from the set of ith+1 order differential equations;

h.   separating the L+1 features into a plurality of classes with a
15   corresponding confidence level; and

i.   iteratively repeating steps (e)-(h) until a plurality of classes for the agent is separated with a desired corresponding confidence level.

29.   The method of claim 28, wherein the agent comprises a chemical agent.
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30.   The method of claim 28, wherein the agent comprises a non-chemical agent.

31.   The method of claim 28, wherein the agent comprises a biological agent.

25   32.   The method of claim 28, wherein the agent comprises a non-biological agent.

33.   The method of claim 28, wherein the parameters comprises a plurality of measurable physical quantities.

30   34.   The method of claim 33, wherein the plurality of measurable physical quantities comprises measurable physical quantities related to metabolic status of a biological agent.

35.   The method of claim 28, wherein the set of ith order differential equations
35   comprises a set of 1st order differential equations of metabolic pathways, signaling pathways, or gene expression interactions.

36.   The method of claim 35, wherein the set of ith+1 order differential equations comprises a set of 2nd order differential equations of metabolic pathways, signaling pathways, or gene expression interactions.

5   37.   The method of claim 28, wherein each of the separating steps (d) and (h) comprises the step of separating corresponding features into a plurality of classes with one of a Principal-Component-Analysis/Cluster separation and a singular value decomposition.

10   38.   A system for discriminating an agent, comprising a controller performing the steps of:

a.   providing a plurality of L parameters, L being an integer, each parameter being related to the status of the agent;

b.   fitting the plurality of L parameters into a set of ith order differential
15   equations, i = 1, . . ., N;

c.   obtaining a plurality of L features corresponding to L parameters, respectively, from the set of ith order differential equations;

d.   separating the L features into a plurality of classes with a corresponding confidence level;

20   e.   providing a plurality of L+1 parameters, each parameter being related to the status of the agent;

f.   fitting the plurality of L+1 parameters into a set of ith+1 order differential equations;

g.   obtaining a plurality of L+1 features corresponding to L+1
25   parameters, respectively, from the set of ith+1 order differential equations;

h.   separating the L+1 features into a plurality of classes with a corresponding confidence level; and

i.   iteratively repeating steps (e)-(h) until a plurality of classes for the
30   agent is separated with a desired corresponding confidence level.

39.   The system of claim 38, wherein the agent comprises a chemical agent.

40.   The system of claim 38, wherein the agent comprises a non-chemical agent.
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41.   The system of claim 38, wherein the agent comprises a biological agent.

42.   The system of claim 38, wherein the agent comprises a non-biological agent.

43.   The system of claim 38, wherein the parameters comprises a plurality of measurable physical quantities.

44.   The system of claim 43, wherein the plurality of measurable physical quantities comprises measurable physical quantities related to metabolic status of a biological agent.

45.   The system of claim 38, wherein the set of ith order differential equations comprises a set of 1st order differential equations of metabolic pathways, signaling pathways, or gene expression interactions.

46.   The system of claim 45, wherein the set of ith+1 order differential equations comprises a set of 2nd order differential equations of metabolic pathways, signaling pathways, or gene expression interactions.

47.   The system of claim 38, wherein each of the separating steps (d) and (h) comprises the step of separating corresponding features into a plurality of classes with one of a Principal-Component-Analysis/Cluster separation and a singular value composition.

48.   A method for discriminating an agent, comprising the steps of:

a.   providing a broad spectrum assay having a plurality of L cell lines, L being an integer, each cell line being able to respond to the agent;

b.   measuring responses of cell line i, $i = 1, \ldots, L$, to the agent;

c.   separating the responses into class m, $m = 1, \ldots, O$, O being an integer and the total number of available classes, with a corresponding robustness factor;

d.   selecting cell line j, $j = 1, \ldots, L$ but $\neq i$, from the knowledge of class m;

e.   measuring responses of cell line j, $j = 1, \ldots, L$ but $\neq i$, to the agent;

f.   defining a set of feature extraction algorithms from the measured response of cell line j, $j = 1, \ldots, L$ but $\neq i$;

g.   selecting cell line k, $k = 1, \ldots, L$ but $\neq i$ and $\neq j$;

h.   measuring responses of cell line k, $k = 1, \ldots, L$ but $\neq i$ and $\neq j$, to the agent;

i.   separating the responses into class n, $n = 1, \ldots, O$, O being an integer and the total number of available classes, with a corresponding robustness factor; and

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     j.   iteratively repeating steps (f)-(i) until a class for the agent with a desired robustness factor is obtained.

49.   The method of claim 48, wherein the agent comprises a chemical agent.

50.   The method of claim 48, wherein the agent comprises a non-chemical agent.

51.   The method of claim 48, wherein the agent comprises a biological agent.

52.   The method of claim 48, wherein the agent comprises a non-biological agent.

53.   The method of claim 48, wherein each of the separating steps (c) and (i) comprises the step of discriminating the responses with a Maximum Likelihood Estimator.

54.   The method of claim 48, wherein the selecting step (d) comprises the step of selecting the cell line according to a desired sensitivity of the cell line.

55.   The method of claim 48, wherein the defining step (f) comprises the step of using a classifier to define a set of feature extraction algorithms from the measured response.

56.   The method of claim 55, wherein the classifier comprises a threshold.

57.   A system for discriminating an agent, comprising a controller performing the steps of:

     a.   providing a broad spectrum assay having a plurality of L cell lines, L being an integer, each cell line being able to respond to the agent;

     b.   measuring responses of cell line i, $i = 1, \ldots, L$, to the agent;

     c.   separating the responses into class m, $m = 1, \ldots, O$, O being an integer and the total number of available classes, with a corresponding robustness factor;

     d.   selecting cell line j, $j = 1, \ldots, L$ but $\neq i$, from the knowledge of class m;

     e.   measuring responses of cell line j, $j = 1, \ldots, K$ but $\neq i$, to the agent;

     f.   defining a set of feature extraction algorithms from the measured response of cell line j, $j = 1, \ldots, L$ but $\neq i$;

     g.   selecting cell line k, $k = 1, \ldots, L$ but $\neq i$ and $\neq j$;

h. measuring responses of cell line k, k = 1, . . ., L but ≠ i and ≠ j, to the agent;

i. separating the responses into class n, n = 1, . . ., O, O being an integer and the total number of available classes, with a corresponding robustness factor; and

j. iteratively repeating steps (f)-(i) until a class for the agent with a desired robustness factor is obtained.

58. The system of claim 57, wherein the agent comprises a chemical agent.

59. The system of claim 57, wherein the agent comprises a non-chemical agent.

60. The system of claim 57, wherein the agent comprises a biological agent.

61. The system of claim 57, wherein the agent comprises a non-biological agent.

62. The system of claim 57, wherein each of the separating steps (c) and (i) comprises the step of discriminating the responses with a Maximum Likelihood Estimator.

63. The system of claim 57, wherein the selecting step (d) comprises the step of selecting the cell line according to a desired sensitivity of the cell line.

64. The system of claim 57, wherein the defining step (f) comprises the step of using a classifier to define a set of feature extraction algorithms from the measured response.

65. The system of claim 64, wherein the classifier comprises a threshold.

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